November, 1955

THE CHEMIST

VOLUME XXXII NUMBER 11

Dr. Arnold O. Beckman

Receives Western Chapter Honor Scroll

(*See Page* 395)

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Presentation of New York Chapter Honor Scroll to Dr. Henry B. Hass, F.A.I.C.
Stimulating Creative Thinking, Dr. Henry B. Hass.
A Survey of Hobbies of Research Directors, by E. M. Bryman and Maurice Holland.
Award of the Chicago Chapter Honor Scroll to Dr. Charles C. Price, F.A.I.C.
The Chemist and Management, Summary of Address by Dr. C. F. Rassweiler, F.A.I.C.

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TO COME IN DECEMBER

"Stimulating Creative Thinking," by Dr. Henry B. Hass, F.A.I.C., is the article you have been waiting for, if we may judge by the number of inquiries about its publication date! With it there will be excerpts from an address by Dr. Emil Ott, F.A.I.C., on the same subject. • Dr. Foster D. Snell, F.A.I.C., presents, "Management Looks at the Chemist," about which he says, "even though to many chemists the word 'management' sounds like something remote, before I finish I hope to have shown you that ninety-nine per cent of you are managers at least part of your time." These articles and other material will make the December CHEMIST worth keeping for its special gift of mental stimulation.

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EDITORIAL

Consumer Credit for The American Institute of Chemists

Dr. Donald B. Keyes, F.A.I.C.
Chairman, Board of Directors, The American Institute of Chemists

"NOBODY BUT NOBODY pays cash today," so I am told. The single exception seems to be those fortunate people who with their pockets bulging with cash casually drop into our non-service, cut-rate, retail outlets and purchase brand-named products at twenty per cent to forty per cent off the listed price.

Each morning along with a reiteration of last night's news, the announcer assures me that I can have all the money I need for any purchase my heart desires by merely stepping into a "conveniently located" bank, signing a piece of paper, presumably without any formality except perhaps the showing of my driver's license. If I need money, and I want a new house, a new car, or a new baby, I merely have to step in and sign that piece of paper.

Do you want to join the AIC but do not have the cash? Do not let this lack of funds disturb you, just step into a "conveniently located" bank and sign the piece of paper. Certainly no banker is going to refuse to loan you money for such a worthy purchase, and remember you have a whole year to pay. If you are so unfortunate as to be forced to give a "down payment," this should not worry you, just submit the card showing that you paid last year's dues to some other reputable organization, for example the A.C.S.

As Chairman of your Board of Directors, I can assure you we would welcome this plan. If all of our members chose to adopt this procedure our Treasurer's life would be one sweet dream. He would receive all dues promptly and no dunning letters from him would ever be necessary. The unpleasant feature of collecting from a delinquent member would be entirely the responsibility of the banker and not your INSTITUTE.

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B-1891X Ditto — but with opal glass plates	20.50

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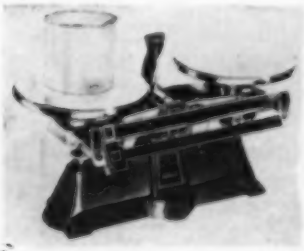

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Presentation to Dr. Beckman

DR. ARNOLD O. BECKMAN, founder and president of Beckman Instruments, Inc., 820 Mission St., South Pasadena, California, was presented with the Honor Scroll of the Western AIC Chapter, at a meeting, May 19, 1955, at Rudi's Italian Inn, Los Angeles. Dr. Kenneth W. Newman, retiring chairman of the Chapter presided.

Dr. Beckman was honored for his distinguished contributions to the field of analytical chemistry and for his development of scientific instruments and techniques which enable chemists to work more efficiently. It was stated that "the name of 'Beckman' is synonymous with the advances of instrumental techniques in all phases of chemistry."

Dr. Beckman was born in Cullom, Illino's. He received the B. S. degree in 1922 from the University of Illinois, followed in 1923 by the M. S. degree. He obtained the Ph. D. degree from California Institute of Technology in 1928. From 1924 to 1926, he worked with Dr. Walter A. Shewhart in the Bell Telephone Laboratories, New York, N. Y. From 1926 to 1940 he was a member of the chemistry staff of California Institute of Technology. In 1934, he founded and became president of National Technical Laboratories, now known as Beckman Instruments, Inc., manufacturers of pH meters, spectrophotometers, and other instruments. He is president (since 1944) of Helipot Corporation, manufacturers of precision multi-turn potentiometers. He is also president (since 1946) of Arnold O. Beckman, Inc., manufacturers of oxygen analyzers and gamma ray dosimeters.

In his acceptance address, Dr. Beckman discussed informally, "The Role of Instrumentation in Chemistry," and answered questions from the audience.

In addition to the honor accorded to Dr. Beckman, the Western Chapter presented student medals to seniors graduating from Western colleges and universities. The seniors to be honored were chosen by the department heads as outstanding students in chemistry. They are:

Richard D'Agostino, Loyola University at Los Angeles
Stanley L. Grotch, California Institute of Technology
Willard V. Harris, Jr., Whittier College
Richard S. P. Hsi, Pomona College
Bernard Kraus, University of Southern California
Kenneth C. Krening, Oregon State College
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Miss Lynore E. Slaten, Immaculate Heart College

Miss Barbara D. Williams, Mount St. Mary's College

Peter Wing-Kee Woo, Stanford University

Newly-elected officers of the Western Chapter were announced for 1956 as follows: Chairman, Thomas J. Rollins; Chairman elect, Frederick G. Sawyer; Vice President, Alfred J. Webber; Treasurer, Thomas Kehoe; Co-secretaries, Gil Sinclair and Donald K. Peterson.

Appointed: H. George Wolfe as advertising manager of Merck & Co., Inc., Chemical Division, Rahway, N. J.

Help Asked on Ordnance Engineering Nomenclature

Your hobby, preoccupation, or annoyance with terminology and nomenclature problems can help an important military project in the field of military engineering!

Ordnance engineering cuts across many fields of science and technology, and information for design work is drawn from many diverse fields of knowledge. If there is some chance that your subject field might be of interest in ordnance work, and if you have formal or informal collections of terminologies, glossaries, specialized dictionaries, or even references to them, please contact:

Allen Kent, Associate Director,
Center for Documentation and
Communications Research,
School of Library Science
Western Reserve University
Cleveland 6, Ohio

The Army Ordnance Corps is preparing an Ordnance Engineering Design Handbook to summarize fundamental principles and basic design data. It will consist of approximately 180 sections of 100 pages each. Completion will require about five years. The Center for Documentation and Communication at Western Reserve University is cooperating in the important area of terminology definition, and is initiating its project by a survey of sources of information.

Engineering Ethics—From the Viewpoint of Industry

Gerry E. Morse

Vice President in charge of industrial relations, Minneapolis-Honeywell Regulator Company, 2747-53 Fourth Ave., South, Minneapolis 8, Minn.

(Mr. Morse presented this paper before a meeting of the American Society for Engineering Education at the University of Illinois in June 1954. His message was such an interesting and important one that he was invited to give a talk at the annual meeting of THE AMERICAN INSTITUTE OF CHEMISTS in May of this year. Unfortunately, he was not available to do so. The AIC Committee on Employer-Employee Relations then reviewed Mr. Morse's paper and recommended its publication in THE CHEMIST, even though it is directed at engineers rather than at chemists. After all, the problems for our profession are much the same as for engineering.)

ENGINEERING ETHICS, from the viewpoint of industry, are of steadily increasing importance. The gain is in proportion to the growth in the depth and complexity of the technology of industrial processes, products, and product application.

The development of modern industrial technology, which has produced a steady rise in living standards through more and better things for more people, has also brought along with it a management problem that almost did not exist forty or fifty years ago. This is engineering in industry.

A half-century ago the invention, development, and application of new products were largely in the hands of the lone inventor and the gadgeteer. Edison, Eastman, and Ford are examples that come readily to mind. Similarly, Minneapolis - Honeywell owes its start to a relatively simple mechanical damper control invented by a tinkerer named Al Butz. Butz' idea was to have a temperature sensing device in the house that would open and close the dampers on the furnace in the basement, and thus eliminate a lot of running up and down the cellar stairs. So, on a rule of thumb, trial and error basis, he applied in rather crude fashion some relatively simple scientific principles to achieve this end. Today in our company, which we characterize as "First in Controls," about one in every ten employees is in engineering or research activities. Our development along this line is not unique. Its parallel, to a greater or lesser degree, is to be found in most manufacturing companies. When we consider that today roughly two-thirds of our total of approximately 400,000

engineers are employed in industry, it is apparent how rapidly this aspect of industry has developed.

The modern industrial product is in many cases a highly complex device in itself, and almost without exception is produced by a highly complicated process. The design of the product and the means for producing it are no longer alone in the hands of the gadgeteer or even of the practical manufacturing man. A modern industrial organization depends on highly talented and trained professional engineers and scientists for the technical aspects of its work. It must employ them in relatively large numbers. Without them it could not exist.

The engineer in modern industry works in areas that are close to the very core of management decision. The engineer is responsible for the technical development of the products, processes, and customer applications on which the success of the business depends. His ability to create, test, control, and improve the product and the soundness and practicality of his professional judgments are important elements in determining the fortunes of the organization. Because organization is dependent upon him, and because he is intrusted with a responsibility that others in it cannot do or often cannot even check, it is essential that the engineer be clearly aware of the ethical requirements of his profession.

Professional Service

While questions of ethics may arise in any interpersonal relationship where one puts himself or his fortunes in the hands of another, they tend to be most serious when professional service is involved. Two basic elements in the professional relationship are responsible. First, a profession is distinguished from a skill or a craft, no matter of how high an order the latter may be, by the degree of subjectivity involved. The professional goes beyond a routine, a formula, or an established habit pattern. He is sensitive to the uniqueness of each situation. His results are not predictable in terms of time or effort but flow from his individual and independent discretion and judgment. He alone knows with what understanding, competency, and likelihood of success he approaches the assignment. Ethically, he has the responsibility to advise his client or employer if other help is required. Parallels are observable in other professions. For example, the clergyman may advise the help of the doctor or the psychiatrist, the physician may advise calling in a specialist, or the jurist may advise his own disqualifications from a case.

Second, the professional is characterized by the specialization of his aptitude, education and experience. He knows and can do what the non-professional does not know and cannot do. In professional matters the non-professional is almost completely

and blindly dependent on him. Ethically, therefore, he has the responsibility to protect his client or employer and the client's or employer's interest. Parallels are observable in other professions. For example, the teacher may advise against further study bebecause lack of aptitude makes it a waste of time, effort and money, or the lawyer may advise dropping a suit because further prosecution of it would simply drain away his client's or employer's funds.

Both of these aspects of the ethics of engineering, or of any profession, may be summarized in the concept that no intentional, and insofar as possible no unintentional, unfair advantage is to be taken of the client, employer or user. Or, to say it another way, the true professional does not trade dishonestly upon the ignorance of others.

Ethics is largely an individual matter. The ethics of an organization or a group tends to be simply an integration of the ethics of its members. It is from this point of view that we approach the question of ethical practice in the engineering profession as it relates to collective bargaining. It is not reasonable to say that membership in a collective bargaining organization in itself alone constitutes a breach of ethics for the individual engineer. Nor is it sound to make a charge of unethical practice on the part of engineering unions except in specific cases where such lack of integrity on their part has actually taken place. Experience to date seems to support the hope that we can have enough faith in engineers as individuals to expect that unethical practice will be found to be one of the least important faults of engineering unions. There are aspects of the problem, nevertheless, which do warrant our study and concern.

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Collective Bargaining Background

Let us review the historical background of the collective bargaining movement among engineers. After the passage of the Wagner Act in 1935, some engineers and other professional employees were, against their will, being forced into labor organizations composed predominantly of non-professional employees. Theoretically, engineers were free to form collective bargaining organizations of their own, or free to deal as individuals. In cold reality they were at a disadvantage because of the NLRB practice of including them in larger units. In such cases, because of their relatively smaller numbers compared with other non-supervisory office or factory employees, they found themselves outvoted in representation elections and included in general factory

or office bargaining units. In 1937, ASCE formed a "Committee on Unionization" to study the problem. Despite ridicule and scorn, ASCE pressed the study and by 1944 had developed a plan under which engineers seeking to organize could receive guidance. Then, in 1947, through the combined efforts of ASCE and the other constituent societies of the Engineers Joint Council, the so-called "professional employee" provisions were written into the Labor-Management Relations Act, commonly referred to as Taft-Hartley. The Act, as you know, guarantees professional employees the right to decide whether they will form a labor organization of their own, be included with a non-professional labor organization, or deal with their employer on an individual basis. It was during this hectic period that most of the present day engineering collective bargaining units were established.

Although we cannot know for certain what was in the minds of those of the engineering profession who were instrumental in creating and developing collective bargaining organizations of professional employees, most of them said on the one hand they were trying to prevent being included in units with non-professionals and on the other hand that they foresaw the development of organizations of professional employees for collective bargaining purposes which would be different in character from the typical labor union. They made the fundamental error of assuming that a collective bargaining relationship between a group of professional employees would be solved forthrightly without resort to the exercise of power or the strategical and tactical maneuvering of the typical collective bargaining situation. Nor is it likely that they foresaw (there is no reason to suppose they had the necessary understanding or experience to do so) that an engineering union or any organization that engages in collective bargaining must inevitably adopt the typical tactics, practices, and characteristics of the trade union.

My experience in collective bargaining convinces me that it is inevitable. Any organization formed for the purpose of collective bargaining, because of the very nature of the demands of its membership upon it and their reaction to its accomplishments on their behalf, will sooner or later be forced to resort to the traditional practices of the typical labor union. There is a clearly observable trend by the engineering collective bargaining organizations of movement in this direction. Those of you who have been following the published reports are aware of it. For example, you see it in the behavior of the collective bargaining organizations representing the engineers of some of the West Coast airplane manufacturers, of some of the electronics companies in the New York city area, and of Minneapolis-Honeywell here in the Midwest.

You see extravagant demands, heated and protracted negotiations, costly strikes, the creation of a national organization, the Engineers and Scientists of America, to extend collective action beyond the scope of the local unit, and action in concert with unions that represent non-professionals.

Some other observable trends within engineering collective bargaining organizations deserve attention. First, the average or better than average engineers, or the ones who really understand the individual and professional nature of engineering work seem to become apathetic toward collective bargaining. They seem to sense the inevitable danger of the tendency of group action to result in "leveling down" and find they can get better job satisfaction, better advancement, and better pay on the basis of their own individual effort than on a group basis. They lose interest in the collective bargaining approach and so do not furnish the stability and leadership qualities to the group that they might if they participated more actively. Second, those of the collective bargaining organizations that have heterogeneous memberships composed of engineers and non-professionals are tending to develop an internal divergence of views and aims. The very fact that the work of the non-professionals lends itself more readily to standardization and the members of the group to more easy interchange makes collective action of interest to them and a more satisfactory experience. Thus, even if they are a minority, their views and power tend to become dominant in the collective bargaining activity. Finally, there is the noticeable restriction on communication between management and the engineer where a collective bargaining representative is selected by the engineers to replace them in dealing with their employer on wages, hours, and other conditions of employment.

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The Individual Aspect

For all of these reasons, there is a very serious question in my mind as to the compatibility of collective bargaining and engineering. There is a fundamental conflict between the practices inherent in collective bargaining and the kind of unregimented atmosphere that must prevail in an engineering organization if it is to function professionally and accomplish the results for which it is employed. An employer does not hire an engineer in the same sense he hires a janitor, an assembly man, a truck driver, or a tool and die maker. He

selects the engineer as a professional, just as he would select his own doctor or lawyer. He is interested in more than technical competence, education, and previous experience. Because he is putting his fortunes into the hands of the engineer insofar as he must rely with complete confidence on the engineer's professional opinions and actions, he is intensely interested in the engineer as a person. Just as a clergyman cannot effectively serve his parishioners unless there is a freedom of communication and sympathetic "ease" between them, or a teacher cannot effectively lead his students to learning unless there is a mutual respect, confidence, and interchange of ideas, so the engineer cannot fill his place in the industrial organization unless he has the right personal "fit." At Minneapolis-Honeywell, for example, we find it necessary to interview about 100 engineers to find ten whom we feel we should consider for employment. Of the ten on whom we spend the time, effort and money for testing, for multiple interviews, and for visits to our plants, we make actual offers to about six. Of the six, only two or three accept and are hired. A similar, although less easily observable selection, takes place in our assignments of work and position advancements of engineers.

A tendency to obscure the professional and highly individual character of engineering employment has resulted from the popularization in recent years of the idea of team-work within the industrial unit. While the engineer is on one hand a member of the team together with managerial, financial, manufacturing, sales, and all the other employee groups that make up the typical company, he remains, on the other, essentially an individual insofar as his professional responsibility is concerned. Even in a department of hundreds of engineers, the fundamental reason for their employment and the requirements of their work remain unchanged. Professional problems are solvable only by individuals. Others may help to stimulate the individual, different approaches that may be tried by different individuals simultaneously; sub-professionals or non-professionals may aid through supplying related, supplemental, or directed services, but in the absence of successful individual effort and accomplishment, the team, or committee, or organization will fail. It is at this point that the incompatibility of professionalism and collective bargaining stands out sharply.

Scientific Method Unsuited to Bargaining

Those of us who have had experience in collective bargaining with engineers have seen the impact that it has upon them. Collective bargaining is a process of give-and-take, of argument, of compromise. In other words, it is collective and it is bargaining. Engineers are not conditioned

by temperament or training to feel comfortable in the pulling and hauling of the collective bargaining process. They tend to seek what they believe to be the right answer to the problems raised, not recognizing that some are purely political, growing out of the needs of a collective action and that others are simply part of the strategy and tactics, the horse-trading, of the bargaining technique. Engineers, tending to approach such problems along the route of the scientific method, are more often than not, bewildered when that does not work and tend to find it a very frustrating experience.

In view of this, how can we account for the fact that some thirteen or fourteen different labor organizations currently represent engineering employees and for the fact that unionization is today one of the "hottest" subjects under discussion by engineers. Primarily, I believe it is one of the manifestations of the awakening of engineers to the fact that engineering is a profession and that its professional status should be raised and made better known to the public. Dissatisfied with the failure to date of any overall unifying organization, some engineers have turned to unionization as a possible answer. They apparently make the error of believing that the overall organizations in the medical and legal professions are collective bargaining organizations.

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Furthermore, the demands which the engineering collective bargaining organizations have made in recent years seem to be based much more on the economic position of the engineer in society than upon dissatisfaction with local conditions. Therefore, we may look upon the question of engineering unions as a national problem rather than a local one. For the moment, at least, engineers as a group seem overwhelmingly concerned with their level of pay. Feeling that the unions and union practices have tended to raise the pay levels of their members, some engineers have turned to unionization as an apparently quick and easy way to get their own pay raised. I believe the engineers who, for whatever reason, choose this approach make a serious mistake and that organization for collective bargaining is definitely not the answer to the engineer's problems. First of all, scientific and engineering accomplishment thrives best in a free and unregimented atmosphere; second, the traditional practices of trade unions, while inevitable, are impra-

ticable in an engineering organization; and third, the engineer by nature and training finds the practices of collective bargaining unsatisfactory and unacceptable.

Courses of Action

Therefore, we need to consider what courses of action we might take in dealing with this problem.

First, the schools and colleges: They must somehow instill in the young engineer the conviction that he is a professional and that he and his profession will progress only in proportion to the exercise of his own abilities and efforts. He must understand that his own inner resources will take him most rapidly and profitably along the road he wants to go. I am not sure that as a layman I know how this can be accomplished, but if engineering is to become a highly accepted profession, those who practice it must learn the meaning and ethical responsibilities of professionalism.

Furthermore, the schools and colleges may defeat their very purpose when they advise or condone the better men refusing employment with a company solely because its engineers are in a collective bargaining unit. It is only by having the better engineers meet this challenge and lend their influence in such groups that the question can be satisfactorily resolved. To isolate them may result in a permanent division of engineers into two opposing camps.

Second, the technical societies: The technical societies must look beneath the surface of the collective bargaining question in order to understand it and meet it. This will take patience and understanding. The problem can be evaluated and solved only in a calm and tolerant atmosphere. It is a problem already overcharged with emotionalism. The societies do need to be more vigorous in finding the key to some unification or integration in professional affairs. On the other hand, to try to meet the problem of unionization by becoming collective bargaining agencies themselves would be fatal. They would inevitably then find themselves moving in the direction of the typical labor union behavior and practices.

Third, industry: Industry has a serious challenge to understand and practice its part in the professional relationships with its engineers. Under the law, if its engineers elect to bargain collectively, it must do so in good faith. On the other hand, it must at the same time make certain that the collective bargaining does not destroy, any more than can possibly be avoided, the maintenance of that freedom of individual accomplishment and of inter-communication that is essential to the attainment of the best professional results.

Finally, the engineer himself: Whether or not engineering advances as a profession or whether collective bargaining or the individual relation-

ship is to be characteristic of the engineer in industry rests almost entirely with the individual engineer himself. The most any of the rest of us can do is to encourage him to take a sincere interest in this important subject, to create an atmosphere conducive to his proper consideration of it and to supply him as completely and objectively as we can with the views, experiences, and data we may have on it. Engineering ethics, from the viewpoint of industry, will rise or fall on the decisions of the engineer himself.

Announced: By Heyden Chemical Corporation, New York 17, N. Y., the election of Arthur Minich as vice president, and of Thomas M. O'Neil as vice president in charge of sales and marketing. Mr. Minich will continue as president of Nuodex Products Co., Inc., a subsidiary of Heyden.

Dedicated: By International Business Machines Corporation, 590 Madison Ave., New York 22, N. Y., in July, its new electronic data processing center on the main floor of the company's headquarters. Twenty-five presidents of leading railroads and groups of executives from other industries watched the demonstration of high-speed digital computers and data processing equipment, including the IBM 701, 702, and 650 electronic data processing machines.

Atomic Exposition: With the Nuclear Engineering and Science Congress, to be held in Cleveland, Ohio, Dec. 12-16, 1955. The congress is coordinated by Engineers Joint Council. Nearly 300 papers will be presented. For information: Cleveland Engineering Society, 2136 E. 19th St., Cleveland 15, Ohio.

Speakers: Dr. J. S. Long, F.A.I.C., chemical director for Devoe & Reynolds Company, who recently addressed the Jackson, Mississippi, Chapter of the National Association of Cost Accountants, on "Purposeful Living."

Dr. W. P. Munro, F.A.I.C., of the Organic Chemicals Division of American Cyanamid Company, who recently spoke on "From Copper to Color Magic," at the Somerset County Historical Society, Somerville, N. J.

New Position: For Dr. Joseph M. Cahill, A.A.I.C., who has joined the staff of the products research division of Esso Research & Engineering Co., Linden, N. J., as chemist. He recently received the doctorate in physical chemistry from Purdue University.

Instructor: Paul C. McKinney, A.A.I.C., who was appointed to this position at Wabash College, Indiana, this fall. He has been doing graduate work at Northwestern University in physical organic chemistry.

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Algae as a Potential Future Source of Food

Dr. A. W. Fisher, Jr., F.A.I.C.

Head, Process Engineering Department, Arthur D. Little, Inc., Cambridge 42, Massachusetts

(Presented at a meeting of the New York Chapter of THE AMERICAN INSTITUTE OF CHEMISTS.)

EVER SINCE THE beginning of recorded history, famine and starvation have been major problems. It has been said that most famines could have been alleviated, if political, economic, and transportation problems had not interfered with distribution of food from more fortunate parts of the world. A cure for many local shortages may ultimately be found in food sources, such as algae, which are not dependent on the vagaries of nature.

In spite of the rapidly increasing population of the world, the incidence and severity of recent famines have been no greater than in earlier history. There have been those who believed that we were close to the limit to world population growth. Thomas Malthus about 1800, Sir William Crooks just before 1900, and more recently, Fairfield Osborn, have predicted that civilization must fall from lack of food. Some of us feel that these pessimists have overlooked human ingenuity.

The effect of the industrial revolution was not limited to the factory and there are many who feel that there will never be a time when man cannot solve the problem of feeding himself. Human ingenuity has been responsible for refrigeration, faster transportation, mechanized farming, synthetic nitrates and other fertilizers, insecticides, and scientific breeding as well as many other tools which allow man to produce more food, preserve it, and deliver it safely to distant points. There is no reason to believe that these developments have reached their limits. It has been predicted that our present agricultural land can produce at least two-hundred per cent more if all known techniques were effectively utilized.

Let us assume, optimistically, that in the year 2000 everyone in the world has at least a minimum diet. The world population is now over two and a half billion and it has been estimated that the population will double again in the next fifty years. This means that in spite of a two-hundred per cent increase in agricultural production our present agricultural land would not carry us very far into the 21st Century. How then can we be optimistic about the long range future, and what solutions are practical? I emphasize the plural because I believe there will be several methods for preventing shortages of food including some which we cannot predict at present.

The simplest of the future possibilities lie in the vast food potential of the ocean. Much more photosynthesis occurs in the ocean than on land, and as far as man is concerned, by far the greatest portion of the resulting materials is wasted. We will not only harvest more fish and crustacea, but will learn to use the microscopic organisms which make up plankton. The Siamese are already doing this with some success.

A second general solution is what Dr. Vannevar Bush likes to call the "process industry" approach to food production. We will grow yeast, molds, fungi, and bacteria for human and animal consumption using currently wasted organic matter and synthetic nitrogen compounds. We will also produce some parts of our diet by chemical synthesis. Methionine, an essential amino acid, which supplements vegetable proteins in animal feeds, is already being manufactured. One of the most promising of the process industry approaches is the mass culture of algae.

Algae, the most primitive members of the plant kingdom, are aquatic organisms of simple structure using photosynthesis as the source of energy for growth and reproduction. There are 17,000 known species ranging from single celled organisms to the giant kelps which may reach lengths of over one-hundred feet. Only a few have ever been studied from the point of view of food, although man has used some of them for centuries and to many members of the animal kingdom they are a natural source of food.

The microscopic types of algae have several definite advantages as food material.[1] They are high in protein, which makes up fifty per cent of normally grown cells. They have a potentially high growth rate with some projections showing from ten to one-hundred times as much usable dry material per acre as conventional crops. Since the algae of the lower types have no structural parts, essentially the entire cell is useful for food.[2] If grown in one of the several types of systems which have been considered, the algae would not require the use of arable land and would be easy to handle in more or less conventional types of processing equipment. Nutritionally, algae contain vitamins and amino acids in a composition very similar to the yeasts. One feeding test on rats in England indicated them to be slightly superior to torulla yeast. Tests with chicks at the University of Maryland have been quite promising, indicating that algae added to feeds might provide both amino acids and vitamins needed for poultry feeds if methionine is added as a supplement.[3] For human

(1) Spoehr, H. A. The need for a new source of food. Algal Culture: from Laboratory to Pilot Plant. Carnegie Institution of Washington, Publication 600: 24-28 (1953).

(2) Milner, Harold W. Algae as Food. Scientific American 189: 31-35 (1953).

(3) Fisher, A. W. Jr., John S. Burlew. Nutritional value of microscopic algae. Algal Culture: from Laboratory to Pilot Plant. Carnegie Institution of Washington, Publication 600: 303-310 (1953).

use, algae has been considered as an additive to foods, particularly in countries such as Japan where severe protein deficiencies exist. Flavorwise, freshly harvested chlorella, the specie which has been grown in quantity, has a mild green vegetable quality while the dried material has a stronger vegetable taste more nearly like that of broccoli or cabbage. The odor of the dried material resembled green tea.[4]

The story of the chlorella pilot plant at Arthur D. Little, Inc., is an interesting one. Like so many technical developments, the idea of growing algae for food stemmed from a study of photosynthesis where it was found that single celled algae made the best tools for exploring the conversion of CO_2 and water to organic matter. Just before World War II, Spoehr and Milner[5] at the Carnegie Institution of Washington Laboratories, working with the alga, chlorella, discovered a much greater effect of environment on composition and growth rate than had previously been expected, By varying the nitrogen content of the culture medium, they could change the fat to protein ratio of the chlorella cell over a wide range. This offered the possibility of controlled food production and after the war, the Carnegie Institution of Washington began intensive laboratory work on this subject.

(4) Morimura, Y. and N. Tamiya. Preliminary experiments in the use of chlórella as human food. Food Technology, 8: 179-182 (1954).

(5) Spoehr, H. A., and H. W. Milner. The chemical composition of Chlorella, effect of environmental conditions. Plant Physiol. 24: 120-149 (1949).

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Results of laboratory studies were encouraging and in 1949 some preliminary engineering studies and small scale experiments were carried out by the Stanford Research Institute. Early in 1951, Dr. Vannevar Bush, president of Carnegie Institution of Washington, decided that a pilot plant operation was needed to determine the feasibility of commercial production. This pilot operation was necessary to confirm certain assumptions, establish a base for preliminary economic thinking and provide preliminary technical data for the ultimate goal of commercial production. Arthur D. Little, Inc., was retained to carry out this large scale assignment.

There was sufficient information available to permit the design of a simple continuous flow system. Cultures of algae were started in laboratory flasks and then transferred to 4-inch diameter vertical glass columns out-of-doors to provide sufficient culture to innoculate the 1200 gallons of

medium in the large unit. The actual growth tube on the roof of the building was a continuous polyethylene tube 4-feet wide, when laid flat, having a wall thickness of 4 mils. The culture was 2.5 to 3 inches deep with a total area exposed to sunlight of about 600 sq. ft. The culture was pumped continuously by a conventional sanitary pump at about 100 gallons per minute. Part of the stream was put through a plate type milk cooler for temperature control. Harvesting was done with a Sharples super-centrifuge of the solid bowl type, with the clarified medium returned to the growth unit. The product was immediately frozen and later dried at low temperature. During three months of continuous operation with the same culture about 80 pounds of dry algae was produced.

This simple description does not indicate the many mechanical and biological problems which were faced. Many difficulties were encountered, some of which were solved while others remain for future studies. The growth data obtained were not consistent because of the many variables and problems, but growth rates on the order of 17 tons per acre per year were demonstrated. A second narrower unit was also operated in order to test the results at higher culture velocities. Once again the data were not quantitatively conclusive, but were encouraging and instructive.

One of the questions to be answered by the pilot plant was whether or not bacteria would provide a serious problem. The types of bacteria encountered in our experiments did not attack the algae. We did not attempt to operate a sterile culture, although in preparing nutrient solutions and in other operations reasonable care was taken to keep contamination at a minimum. We had one serious infestation of a low animal organism, one of the rotifera, considerably larger than the algae and capable of ingesting whole algal cells. These could easily be removed by selective centrifuging, but actually were destroyed by heating the entire culture to a temperature at which only the algae survived.

Based on the results of our operating experience, a possible commercial system was devised which we believe could be built and operated successfully. It should be emphasized that this is not necessarily the plant of the future since there are many possibilities which we believe will be proved out by future work which would simplify and modify the design. As the basis for cost estimating, ten units were assumed each occupying 10-acres of which about 65 per cent was covered with culture. Harvesting and control of large size contaminants was projected in a three-stage centrifugal operation ending up with a paste of algal cells to be spray-dried in a central processing plant. Since algae spoil rapidly when concentrated

to a paste, it is necessary to dry them immediately. The possibility of freezing was considered too expensive for large scale operations.

The results of the investment cost estimates indicating a figure of about $30,000 per acre are shown in the table below. This cost is very high relative to any type of conventional agriculture, but since the production rate is much higher, it is not as serious as it seems at first glance. Of particular importance is that almost half of the capital investment is involved in the cooling system required to maintain the culture at 25°C.

Estimated Costs for Large Scale Algal Culture

Basis: 100 acres total, 65 acres of culture
12,800 lbs/day, 350 days/year

A. *Investment Cost Estimate*	
Area preparation and growth tubes	$ 220,000
Circulation of Culture	440,000
Cooling of Culture	1,180,000
Preharvesting	240,000
CO_2 and Nutrient System	100,000
Central Harvesting and Drying Plant	300,000
General Facilities, Engineering and Contingencies	740,000
Total	$3,220,000
B. *Operating Daily Cost Estimate*	
Labor and Supervision	$ 951
Utilities and Supplies	767
Charges on Investment	1,379
Total	$ 3,097

Cost per pound of dry products—24.8 cents

The estimate of production cost shows that charges based on investment are essentially half of the total, with labor making up more than half of the remainder. The estimated cost before sales expense and profit of about 25 cents is too high to be competitive at the present time, but is close enough to suggest that future work should bring it into the competitive range, particularly when the cost of other sources of protein increases.

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It can be seen from the production cost figures that increasing the growth per unit area would be one of the most effective means of reducing cost since labor and investment charges would not increase significantly. The figures presented are based on the growth rate of 35-tons per acre per year because it was felt that pilot plant and laboratory results indicated that this was a practical operating level. Two of the most critical approaches to the problem of reducing cost are, therefore, the search for strains of algae which will grow more rapidly than the assumed 35-tons per acre per year, and strains which can grow at a temperature which would not require any artificial cooling. Fortunately, progress in both of these subjects has been made since the pilot

plant experiments. A strain of algae with a high-growth rate and an optimum temperature of 39°C has been isolated, and its growth characteristics are being studied. The elimination of the cooling facilities would reduce the investment in our preliminary operating scheme by almost half which would mean a reduction of 7 or 8 cents per pound in the production cost estimate. If an increase of growth rate to 50 tons per acre per year could be realized, this would further reduce the production cost into the range of about 12 or 13 cents which is approaching the present selling prices of competitive materials. We believe that eventually further studies on processing techniques and other important cost factors can bring the cost below 10 cents.

It is interesting to speculate on the future possibilities of algae as a source of food. It has been estimated by J. S. Burlew that at 35 tons per acre per year one-half the protein requirement of the present world population could be produced in an area only slightly larger than the state of Rhode Island.[6] A projection 100 years into the future suggests that 19% of the total land area would supply the world with its total energy needs. It is doubtful that algae will ever be a significant factor in the fuel picture in the future, however, because of the rather poor efficiency of converting solar energy to heat energy as compared with other solar methods under development.

At the present time pilot plant work on algal culture is going on in Japan under Prof. Hiroshi Tamiya at the Tokugawa Biological Institute. The effort in this country and abroad at present is limited to laboratory scale studies. A variation of mass culture is being developed at the University of California at Berkeley under Prof. Harold B. Gotaas of the Sanitary Engineering Department.[7] This work involves the symbiotic growth of bacteria and algae in sewage oxidation ponds with subsequent harvesting of the algae from the effluent. It is possible that the sewage disposal technique will be the first large scale source of algae for animal feed and industrial use in this country, while the Japanese may well lead the way in utilization of algae by humans.

While we in this country will probably not eat appreciable quantities of algae in the next few decades, it is quite possible that other parts of the world will come to regard them as common foods. Ultimately, it should be possible to keep pace with population growth by extension of algal culture, possibly by techniques which we have not yet studied experimentally.

(6) Burlew, John S. Current status of the large scale culture of algae. Algal Culture: from Laboratory Pilot Plant. Carnegie Institution of Washington, Publication 600: 3-23 (1953).

(7) Gotaas, Harold B., William J. Oswald and Harvey Ludwig. Algae symbiosis in oxidation ponds. II Growth Characteristics of chlorella pyrenoidosa cultured in sewage. Sewage and Ind. Wastes 25, 26-37 (1953).

Communications

Invention Cannot Be Hired

To the Editor:

According to the letter of Dr. Frank Makara (THE CHEMIST, October 1955), a research chemist is a captive slave, the product of whose labor belongs entirely to his employer.

As the courts have expressed it, invention is a sudden inspiration as the result of intuition. Intuition is a familiarity with many associated facts acquired by a multiplicity of explorations and observations in the field; in other words, facts previously acquired as a result of a lot of hard, preliminary, unproductive work in established and known procedures.

The research chemist brings to his work an estimated $20,000 to $40,000 investment, which is usually greater than the per capita contribution of the employer. A business relationship exists, squeezed by legal definition into a job relationship.

The time of a research chemist only is hired, much as other capital equipment for the application of prior arts and skills. If a patentable invention results with novelty and utility, it is the property of the inventor by constitutional right. He has *exclusive* rights to his property.

The subsequent use of the invention presents a contractual relationship, such as shop rights, between interested parties.

Some employers and lawyer hirelings, labor leaders, and political publicists strive to appropriate the property rights of the inventing milch-cow, and on assignment, promptly destroy the inventor's rights to income from the property and fire him. A few exceptions will not change this picture.

Exploring this further, the patent situation needs support from the professional institutes to the extent of making patents unassignable, provision for the unequivocal determination of the true inventor and extent of invention, exclusion of the "me too" climber on the band wagon, registry of the contractual relations for the use of the patent (patents are charged with public interest), protection of contractual rights of all parties, right of full entry and inspection and prosecution for infringement.

The innovator needs protection and his share of the results of his work.

—Dr. John A. Steffens, F.A.I.C.
New York, N. Y.

For AIC Voters to Consider

To the Editor:

I always look forward to receiving THE CHEMIST. Your publication is certainly a valuable service, the primary service to Western AIC members, until more Western Chapters are organized. If it is possible, I think that the selection of more councilors and officers from the Western area might enhance the growth of the INSTITUTE.

—Dr. Garth L. Putnam, F.A.I.C.
Seattle, Washington

Suggestion to Patent Office

To the Secretary:

Older people should be entitled to a little special consideration during the last few remaining years of life. I have in mind that patent applications of U. S. citizens who have reached the age of seventy years should receive special attention from the U. S. Patent Office and be processed within two years. Examiners should take action within two months after such an application is filed, and all replies by the patent lawyer and the examiner should be made within two months. The life expectancy of a man over seventy is not great. And if he gets a patent, perhaps a patent of value, not many years are left to enjoy the fruits of his efforts. (There would probably be so few cases of this nature, that such a ruling would do more good than the improbable harm that might come from a slight rescheduling of the order of patent applications.)

—Dr. Eric C. Kunz, F.A.I.C.
Fletcher, N. C.

Careers in Patent Work

To the President:

The New York Patent Law Association, desiring to serve the public by attracting to the patent law profession those most fitted to serve in it, has prepared the enclosed circular for forwarding to those on your staff who are in a position to help young people choose a career; particularly those associated with your student chapters. It is also addressed to those who have been active in allied pursuits, such as science, engineering, technical writing or general law practice. The circular discloses an unusual opportunity to begin a

career in patent work with a position on the examining staff of the United States Patent Office in Washington, D. C.

The New York Patent Law Association will be glad to furnish a speaker to discuss the United States patent system. This may be arranged by writing to the undersigned, c/o Underwood Corporation, 35-10 36th Ave., Long Island City 6, N. Y.

—S. C. Yuter, Vice-chairman
Public Relations Committee

Note: Some of the information given in the circular appears on page 421.

Winner: Jerry Weisbach, A.A.I.C., of 649 Empire Blvd., Brooklyn, N. Y., who has received a National Science Foundation Fellowship at Harvard University, Cambridge, Mass.

New Officers: Of the Chemical Industry Association: Robert S. First, of National Lead Company, president; David A. Teaze, Carbide & Carbon Chemicals Co., vice president; Howard J. Sanders, *Chemical & Engineering News*, 2 Park Ave., New York 16, N. Y., secretary; and Shepherd Stigman, F.A.I.C., of Foster D. Snell, Inc., treasurer.

Fulbright scholarships: Available to U. S. citizens between the ages of 18 and 35 with B.S. degree, for foreign study in twenty-one countries. For information: Institute of International Education, 1 E. 67th St., New York 21, N. Y.

Elected: Dr. Maurice L. Moore, F.A.I.C., of Vick Chemical Co., as president of the Association of Research Directors. John H. Nair, F.A.I.C., of Thomas J. Lipton, Inc., was elected vice president. Dr. Roger Lueck, American Can Company, was elected three-year councilor.

New Officers: Of the Chemical Institute of Canada, 18 Rideau St., Ottawa 2, Canada: President, Dr. Roger Gaudry; Vice president, Dr. Clifford B. Purves; Chairman of the Board, Frank K. Rogers; Treasurer, T. H. G. Michael, and General Manager and Secretary, Dr. Garnet T. Page. The 1956 Annual Conference will be held in Montreal, Quebec, May 28-30.

Honored: Dr. Milton Harris, F.A.I.C., president of Harris Research Laboratories, Inc., 1246 Taylor St., N.W., Washington 11, D. C., with the honorary degree of Doctor of Textile Science, by the Philadelphia Textile Institute, in recognition of his contributions to the textile industry. He was also elected to the board of trustees of the Philadelphia Textile Institute.

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AIC Activities

Washington Chapter

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First Meeting of Season

At the first meeting of the season, on October 11th, the following committees were appointed:

History of Chapter,
C. B. Broeg, chairman
Fellowship, J. C. Moore, chairman
Legislation, F. S. Magnusson, chairman
Membership, M. J. Pro, chairman
Student Awards,
Miss E. M. Hewston, chairman

Approval in principle was given to a suggestion that the procedure of awarding the AIC medal be modified, and the chairman was requested to so notify the National Council.

The speaker, Paul H. Robbins, executive director of the National Society of Professional Engineers, was introduced by John Williams.

Mr. Robbins pointed out that professional people have a common goal: (1) They are members of a profession; (2) they desire gain or remuneration in keeping with standards, and (3) they want

recognition for their profession, education, experience, and productivity The professions of law and clergy conduct private practices and deal with individuals and the public. However, engineers and chemists are mostly employees and, as a rule, they deal neither with individuals nor the public. Engineers and chemists are subject to the entire criteria of employee-employer relationship, with the result that frequently, their special problems are not recognized.

Surveys of engineering and scientific personnel have been along five general lines:

1. Communications: Transmitting ideas, and understanding by top management of engineers and their problems, and vice versa.

2. Attracting and keeping engineering personnel happy and productive: Management must recognize the unique conditions, such as atmosphere and workload, pertaining to professional personnel.

3. Utilization: Professional personnel should be devoting their time to professional problems and not to clerical work.

4. Training: Adequate college preparation and post-college development of young men is essential.

A lively question and answer period followed in which unionization of professional personnel was discussed.

New Jersey Chapter

Chairman, Dr. Cecil L. Brown
Secretary, Dr. Albert B. Scott
Merck & Company
Rahway, N. J.
Treasurer, Dr. William R. Sullivan
National Council Representative,
Dr. H. W. Mackinney

Training Future Scientists in Our Schools

The New Jersey Chapter met jointly with the Raritan Valley Subsection of the American Chemical Society and the New Jersey Chapter of the American Institute of Chemical Engineers, October 26th, at the Clinton School, Plainfield, N. J. The program consisted of a panel discussion on "Training Future Scientists in Our Schools," moderated by Warren M. Davis, principal of North Plainfield High School, who was introduced by Dr. C. L. Brown, the New Jersey AIC Chapter's chairman. About 125 people attended, a substantial number of them from the teaching profession.

Dr. Donald B. Keyes, speaking on "Scientists and Engineers Can Help Our Schools," emphasized the importance of good teachers. These can be had if we "pay 'em well and treat 'em right." Technical people must sell the importance of good teachers and adequate facilities to their fellow-taxpayers and should make it their business to be acquainted with science teachers in their community. His appeal to teachers to demand a return to the merit rating system instead of seniority evoked considerable discussion. The president of the New Jersey Science Teachers' Association, Harold Hainfeld, reviewed "Problems Confronting the Science Teacher," which include inadequate salaries and facilities, heavy teaching loads and the need for guidance from the state office of education in the form of revised syllabi for the science curriculum.

Dr. Peter van der Meulen, Rutgers University, speaking from the university professors' point of view, stressed the importance of good high school preparation for the study of science in the university. English and mathematics are particularly important. He asked for bonuses for teachers who undertake advanced study in science instead of pedagogy.

New York Chapter

Chairman, Richard L. Moore
Chairman-elect, Dr. Murray Berdick
Secretary, George Foy
Shulton, Inc.,
Fine Chemicals Div.,
Route 46, Clinton, N. J.
National Council Representative,
John Kotrady

Gold Key Awards

The New York Chapter met October 20th at The Chemists' Club, New York, N. Y. to present Gold Key awards to its former chairmen, and to hear Dr. Otto Eisenschiml, chairman, Scientific Oil Compounding Corporation, speak on "A Bird's Eye View of Our Chemical Profession." Richard L. Moore, chairman, presided and gave the audience "A Ten Minute Trip Around the Last Twenty-eight Years." Dr. Lincoln T. Work, honorary chairman, then presented the gold keys to those former chairmen of the Chapter who were present.

The Gold Key Award recipients and the years they served as chairmen were:

Charles V. Bacon, 1924-26 (2 terms)
Howard S. Neiman*, 1926-27
F. E. Breithut, 1927-28
Lloyd Van Doren, 1928-29
M. L. Crossley, 1929-30
F. J. Kenney*, 1930-31
John M. Weiss, 1931-32
D. D. Jackson*, 1932-33
Ross A. Baker, 1933-34
B. H. Knight*, 1933-35 (2 terms)
Raymond E. Kirk, 1936-37
William T. Read, 1937-38
F. J. Kenney*, 1938-39
Frederick Zerban, 1938-39
Harry G. Lindwall, 1939-40
William H. Gardner, 1940-41
Donald Price, 1941-42
E. H. Northey, 1942-43
Marston L. Hamlin, 1943-45 (2 terms)
A. Lloyd Taylor, 1945-46
John J. Miskel, 1946-47
L. H. Flett, 1947-48
Martin Meyer, 1948-50 (2 terms)
Maurice J. Kelley, 1950-51
Henry B. Hass, 1951-52
Karl M. Herstein, 1952-54 (2 terms)
John Kotrady, 1954-55

Dr. Eisenschiml appealed to chemists to concern themselves with the kind of publicity about them that appears before the public. Our publicity from industry, he said, talks about chemistry but not about chemists. "I've never seen a story of chemists' achievements read right. It usually says, 'The laboratories of such and such company turned out something or other.'" He commented on the disproportionate amount of space given to an obituary of a chemist and that of an actor or artist. He asked, "How many monuments are there in the United States honoring chemists?" Among other things, he recommended that a stock speech be prepared on the profession to be delivered by all chemist members of a speakers' bureau to disseminate information, and he called for suggestions and ideas of things to be incorporated in such a speech.

The reception hour preceding the dinner was sponsored by Evans Research and Development Corporation.

*Deceased.

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Chicago Chapter

Chairman, Clifford A. Hampel
Chairman-elect, Dr. Edmond Field
Vice Chairman, Richard G. Maguire
Secretary, Dr. Harold M. Coleman
Armour Research Foundation
10 West 35th St.,
Chicago 16, Ill.
Treasurer, Dr. C. A. Johnson
National Council Representative,
Dr. Johan A. Bjorksten

You and Management

Dr. Burleigh B. Gardner will speak at the meeting of the Chicago Chapter to be held November 11th at the Chicago Engineers Club. He is currently executive director of Social Research, Inc., consultants to management, specializing in organization, executive personality analysis, human relations training, advertising and media research. He is lecturer at the University of Chicago on human relations in industry, and is co-author of a book on human relations in industry. Dr. Gardner's subject will be "You and Management."

An Inventory of Thoughts

The November issue of the *Newsletter* of the Chicago Chapter asked the following questions of several AIC members: (1) Has the AIC succeeded in influencing the professional and economical status of chemists today? (2) What has the organization offered you as an active participant? Excerpts from a few of the replies are given here:

"The AIC has brought into open discussions questions concerning salaries,

working conditions, employment practices and competitive stature of the chemist. Participation has given me an opportunity for expression and a means of acting on the above existing problems."—Clifford Hampel.

"The organization has an indirect effect. The salary which has been approved by the New York Chapter was brought to the attention of Civil Service Organizations in New York. The Model Contract has been a value to the big companies. In many instances there has been an adjustment based on reports put out . . ." —Lloyd Hall.

"Improvement is slow in coming but sure. The AIC has brought attention to the practices on restrictive agreements, 'gentlemen's agreements', and mass layoffs . . . The Check List of the AIC is available for the newcomer in the chemical industry. This covers points of information an applicant should obtain in order to evaluate job opportunities. The organization has improved my profession which directly affects me."—Bernard Friedman.

". . . The derivation from the organization is directly proportional to the participation. My active participation and contact led to personal and professional growth."—Herman Bloch.

"The AIC is a small organization which makes it easy to become active and become a part of stimulating influence. There is doubt whether the influence is direct but one can view the indirect influence by noticing that the AIC members have dominated the Career Conference and that the former chairmen are now active in the A.C.S."—Ed. Field.

"The AIC is a society of chemists rather than chemistry . . . The AIC has influenced the A.C.S. in acting on the economic status of chemists." — Rolston Bond.

Employment Advisory Service

The *Newsletter* points out that the Chicago Chapter has a service to help its members find out about the reputation of prospective employers. The purpose of this service is to make available as much as possible to each member seeking employment with a particular organization the present or past experience of other AIC members who are working or have worked for that particular organization. The information exchanged between both parties will be the concern of the parties only and no records of information will be kept. Such a service . . . will help AIC applicants make better choice of intended employers.

The procedure for using the service is as follows:

(1) Obtain a request for use of the service from the Secretary.

(2) Fill out the form and enclose fifty cents for use of the service.

If available, the secretary will send you names of AIC members qualified to advise you about the organization(s) in which you are interested. The secretary is Dr. Harold Coleman, Armour Research Foundation, 35 W. 33rd St., Chicago 16, Ill. (CA 5-9600, Ext. 646).

Pennsylvania Chapter

Chairman, Hillary Robinette, Jr.
Secretary-Treasurer, Dr. John J. Bohrer
International Resistance Co.
401 N. Broad St., Philadelphia 8, Pa.
National Council Representative,
Marcus Sittenfield

November Meeting

The Pennsylvania Chapter is meeting on November third, at the Engineers' Club, Philadelphia, Pa. John H. Nair, director of research, Thomas J. Lipton Company, speaks on "You Be the Judge: How Mrs. Housewife Influences the Development of New Food Products."

Will You Come

Nov. 8, 1955. Washington Chapter. Luncheon meeting at O'Donnell's Sea Grill, 12:15 p.m. Several matters of business will be discussed. Paul E. Reichardt will describe developments in connection with the Underground Storage of Natural Gas in the Washington Area.

Nov. 11, 1955. Chicago Chapter. Engineers Club. Cocktails 6 p.m. Dinner. Speaker: Dr. Burleigh B. Gardner, Executive Director, Social Research, Inc. Subject, "Management, Morale and the Professional Man."

Dec. 1, 1955. Pennsylvania Chapter, Penn-Sherwood Hotel, Philadelphia. Presentation of Honor Scroll to Dr. Mary L. Willard. Reception 6:30 p.m. Dinner 7:15 p.m.

Dec. 1, 1955. New Jersey Chapter, in cooperation with Rutgers University Chapter of A.C.S. Affiliates. Physics Lecture Room, Rutgers Univ., New Brunswick, N. J. Panel Discussion, "The Facts of Life for Chemists." Moderator: Prof. Mason W. Gross, Provost of Rutgers University. Speakers: Prof. Hubert N. Alyea, Professor of Chemistry, Princeton University; Dr. Mario Scalera, Director of Research, Bound Brook Labs., Research Div., American Cyanamid Co. Meeting at 8 p.m. All scientists, in addition to members of sponsoring organizations, are invited.

Dec. 14, 1955. National Council and Board of Directors of The American Institute of Chemists. The Chemists' Club, 52 E. 41st St., New York, N. Y. Board meeting at 5:30 p.m. Council meeting 6:00 p.m. Dinner.

Jan. 12, 1956. New York Chapter. Presentation of Honorary AIC Membership to Dr. H. B. McClure, F.A.I.C., president of Carbide & Carbon Chemicals Co. Hotel Commodore, New York, N. Y. For information, S. Stigman, Foster D. Snell, Inc., 29 W. 15th St., New York 11, N. Y.

Jan. 13, 1956. Chicago Chapter. Speaker, Ethelyne Cortelyou, "Homme ou Femme Chimiste. Peut on les distinguer professionellement?" For information: Dr. Harold M. Coleman, Armour Research Foundation, 10 W. 35th St., Chicago 16, Ill.

Feb. 8, 1956. National Council and Board of Directors of The American Institute of Chemists. Scheduled for Akron, Ohio.

Feb. 10, 1956. New York Chapter. Joint meeting with American Chemical Society. Carbide & Carbon Cafeteria, 30 East 42nd St., New York, N. Y.

April 26, 1956. New York Chapter. Theme: "So You're Going to be a Chemist." Student Medal Awards.

May 3, 1956. New Jersey Chapter. Presentation of Honor Scroll. Newark, N. J.

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June 7, 1956. New York Chapter. Annual Dinner Meeting. Hotel Commodore, New York, N. Y. Honor Scroll Presentation.

May 9-11, 1956. AIC Annual Meeting. Hotel Statler, Boston, Mass. The New England Chapter will be our host.

For Your Library

Microbiology—An Introduction

By Ernest A. Gray. Philosophical Library. 1955. 175 *pp.* 5" x 7½" $3.75.

As chief bacteriologist for Bazer's Biological Institute, Mr. Gray has had years of experience in teaching classes of laboratory assistants who needed a general knowledge of microbiology in order to understand the reasons for the various techniques in which they were trained. This slender volume is the result of that teaching and presents a clear, comprehensive introduction to this science, stressing historical background which is often forgotten. Beginning with the biology of micro-organisms and ending with applied microbiology, the book covers: the culture

and control of micro-organisms; the host-parasite relationship of cells; viruses; bacteria; yeasts, molds and fungi; algae; protozoa; the microbiology of soil, and the microbiology of inland water and the sea.

Numerous plates, complete references and a subject index make this a useful addition to the library of anyone interested in the field.

—Dr. Frederick A. Hessel, F.A.I.C.

The Chemistry and Fertility of Sea Water

By H. W. Harvey. Cambridge University Press. 1955. 224 *pp.* 5¼" x 9". $5.50.

Recent investigations of sea-water have revealed interesting information about them as a milieu for plant and animal life. Mr. Harvey, who is connected with the Marine Biological Association of Plymouth, England, presents these findings in a book which will be of real value to all.

The first part of the volume is devoted to the environment of the flora and fauna and contains chapters on the composition of sea water, the currents and other forces which affect its salinity, changes in its composition due to plants and animals and to bacteria, factors influencing the growth of plants, and, finally, the interrelation between plant production and animal communities.

Part II, dealing with the chemistry of sea water, covers: Salinity, Chlorinity, Specific Gravity, Osmotic Pressure, Conductivity; the major and minor constituents; the Carbon Dioxide System; Dissolved Oxygen, Nitrogen and Inert Gases, and some Analytical Techniques which are reviewed in collaboration with Dr. F. A. J. Armstrong.

For all who would study the sea, which is becoming of greater and greater interest as a source of food and raw materials, this well-documented and indexed book will prove extremely useful.

—Dr. Frederick A. Hessel, F.A.I.C.

Chemical Books Abroad

Rudolph Seiden, F.A.I.C.

Benno Schwabe & Co., Basel: *Uebersicht der gebraeuchlichen und neueren Arzneimittel,* by E. Bernoulli and H. Lehmann; 8th ed., 508 pp., Sfr. 18.50—A new edition of this compilation (according to indications) of specialties and official drugs used in Switzerland (see THE CHEMIST, March 1950); it gives their compositions, properties, dosages, and manufacturers.

English University Press Ltd., London E.C.1; *Biochemistry,* by P. H. Jellinck; 1954, 199 pp.; 6 s.—In an easily understandable manner, the reader is introduced to facts of the chemistry of living matter and to the wide application of biochemistry in medicine, agriculture and industry. • *The Slide Rule,* by B. Snodgrass; 1955, 207 pp.; 6s.—As in the aforementioned "teach yourself book," the stress in this volume, too, is upon imparting a clear understanding of the fundamentals of the subject matter—here the slide rule. The examples and 80 problems (with answers) are so selected as to arouse interest in the many applications of this simple instrument to everyday problems in school, home, laboratory, and factory.

Ferdinand Enke Verlag, Stuttgart—W: *Pflanzenernaehrung,* by F. Scheffer and E. Welte; 3rd ed., 240 pp. (46 ill., 69 tables); DM 23.50—An up-to-date text book of plant nutrition. It treats in addition to the well-known nutrients, the trace elements, enzymes, hormones, vitamins, and antibiotics in accordance with the latest findings in the field. • *Die chemische Fabrik,* by H. Truttwin; 1955; 220 pp. (205 ill.); DM 32.—An internationally known industrial consultant has laid out in a lucid manner an enormous mass of information about the construction of chemical plants, their equipment, the processes performed in their manufacturing departments, and suggestions for the sales and patent departments. • *Magische Gifte,* by V. A. Reko; 3rd ed., 175 pp.; DM 8.80—The inherent dangers of the following narcotic poisons—as yet not too well known—are depicted in detail (often based on actual case reports): ololiuqui; peyotl: marihuana (hashish); chicalote; ayahuasca; toloachi; colorines; sinicuichi; coztic-zapote; nanacatl; xomil-xihuite; minapatli; (Hierbas) locas: camotillo; and cohombrillo.

Editio Cantor, Aulendorf i. Wuertt.: *Der Schweiss,* by H. P. Fiedler; 1955, 284 pp.; DM 16.20—Sweat, its secretion from the glands, its properties and composition, and the causes and control of normal as well as abnormal perspiration are discussed; there are also 292 cosmetic and therapeutic formulas of antiperspiration preparations and 1,062 literature refer-

ences. • *Chlorakne,* by W. Braun; 1955, 90 pp. (30 ill.); paperbound DM 12.80.—An investigation of interest to those concerned with occupational diseases; it deals with the causes and prevention of acne-like dermatoses caused by chlorinated hydrocarbons.

Opportunities

Doris Eager, M.A.I.C.

AIC members who are seeking positions may place notices in this column without charge.

Positions Available

Research Personnel: College graduates with experience in research and development are offered a wonderful opportunity in the field of zirconium metallurgy and chemistry. Location near Buffalo, New York, Box 111, THE CHEMIST.

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No. 3. Chemical Engineer or Mechanical Engineer who will be responsible for a process design and cost estimating group engaged in guiding development work in the manufacture and spinning of new fibers.

Please address inquiries or send resumes to Personnel Development, Inc., 122 East 42nd St., New York 17, N. Y. (This is a management consulting firm. There is no fee to applicants.)

Chemists Available

Chemical Patent Lawyer, with excellent background, engineering and petrochemical experience seeks increased responsibility of a supervisory nature. Presently employed. Box 116, THE CHEMIST.

Literature chemist, experienced library supervisor in foods, petroleum, and editor of well-known bulletin of abstracts on petroleum research, desires responsible position, preferably technical writer, editor, abstractor, public relations. Chicago Loop or northwest suburbs, New York, or Miami, Fla., preferred, but will consider other locations. Box 110, THE CHEMIST.

Polymer Chemist, F.A.I.C., Ph.D. Ten years supervisory experience in synthesis and application of plastics, synthetic rubbers, surface coating, petrochemicals. Interested in challenging commercial development position making full use of scientific, administrative, and business experience. Box 114, THE CHEMIST.

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Something New

"Fabricated Haveg 1810." Brochure 12-pp. Request from G. R. Runk, Fabrication Div., Haveg Corp., 900 Greenbank Rd., Wilmington 8, Del.

"For Quality and Color in Thermosetting Molding Compounds." Illustrated folder. Barrett Division, Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.

"Plaskon Nylon Molding Compound and Plaskon Polyethylene Lubricants." Folder. Barrett Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.

"Three New Resins for Paper Industry." Technical service bulletins. Department SO, Monsanto Chemical Co., Springfield, Mass.

"Metrolin #209-30. Linseed resin copolymer for use in interior flats." Information and samples. Brown-Allen Chemicals, Inc., P.O. Box 1, Staten Island 2, N. Y., Dept. S-29.

"EPON Curing Agent BF3-400 for use with EPON Resins." Data Sheets. Shell Chemical Corp., 50 W. 50th St., New York 20, N. Y.

"Plastic Pipe Fittings." Information. Reflin Co., 5730 Kearny Villa Rd., San Diego, Calif.

"The Shaping of Things to Come." Sound Color Film on Plastic Molding. 16 mm. May be borrowed by paying transportation costs. Rothacker, 729 Seventh Ave., New York 19, N. Y.

"Transparent Plexi-Glas Circular Saw Safety Guard." Information. General Scientific Equipment Co., 2700 W. Huntingdon St., Philadelphia 32, Pa.

"National Science Foundation Postdoctoral Fellowships." For information: The Fellowship Office, National Research Council, 2101 Constitution Ave., N.W. Washington 25, D. C.

"Bacteriological Services." Leaflet. Foster D. Snell, Inc., 29 W. 15th St., New York 11, N. Y.

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"Shortages of Scientists and Engineers in Industrial Research." Report prepared for National Science Foundation by Bureau of Labor Statistics. For information: National Science Foundation, Washington 25, D. C.

"Guide to Preparing Your Resume." Booklet. N. Y. State Employment Commercial and Professional Office, 1 East 19th St., New York 3, N. Y.

"Kim-Clip," spring clip to hold melter's spectacles or plastic protective shields over prescription lenses for welding operations. Fits all types of spectacles. Information. Kimball Safety Products Co., 9310 Wade Park Ave., Cleveland 6, Ohio.

Brochure describing "Encyclopaedia of Organic Chemistry," 52 pp. "Catalogue of Scientific & Technical Publications." Brochure describing "Chemistry of Carbon Compounds" series. Request from Elsevier Press, Inc., 2330 Holcombe Blvd., Houston 25, Texas.

"Truesdail Laboratories, Inc." 24 pp. illustrated brochure. Truesdail Labs. Inc., 4101 N. Figueroa St., Los Angeles 65, Calif.

"Mining for Nickel." Excellent educational film in Eastman color. 45 minutes. For information, International Nickel Co., Inc., 67 Wall St., New York, N. Y.

"R. S. Aries & Associates." 16-pp. booklet. R. S. Aries & Associates, 270 Park Ave., New York 17, N. Y.

"Consultation . . . Synthetic Detergents & Surface-active Agents." Leaflet. Dr. Donald Price, F.A.I.C., 123 East 92nd St., New York 28, N. Y.

"New metallurgical Technique — Metal Fibers made into Felts." Information. E. W. Wickert, Manager of Licensing Operations, Armour Research Foundation, 10 W. 35th St., Chicago 16, Ill.

"Germanium & Silicon Lenses." Technical Circular RD 516, Dept. SN, Baird Associates, Inc., 33 University Road, Cambridge 38, Mass.

"Silicone-treated glassware, using EF-4141 and EF-4010." Information. Dow Corning Corp., Midland, Mich.

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AIC Reprints Available

"The Employed Chemist and His Employer." Report of Committee on Employer-Employee Relationships. E. H. Northey, Chairman. (20 cents each.)

"An Educator Observes the Chemist." By Dr. Roger Adams, Hon. AIC. (15 cents each.)

"A Proposed Contract for Chemists and Chemical Engineers." Prepared by the Sub-Committee of the Committee on Employer - Employee Relations. Chairman of Sub-Committee, Dr. Lloyd A. Hall. (15 cents each.)

"Sizing Up Members for the Team." Paper on techniques of interviewing applicants for positions. By Dr. George L. Royer. (15 cents each.)

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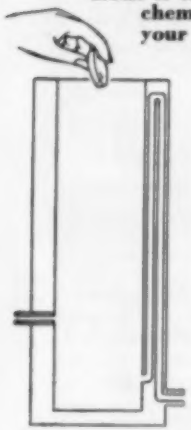

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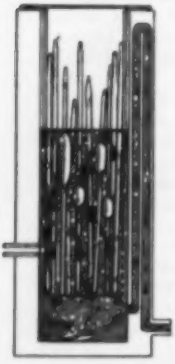

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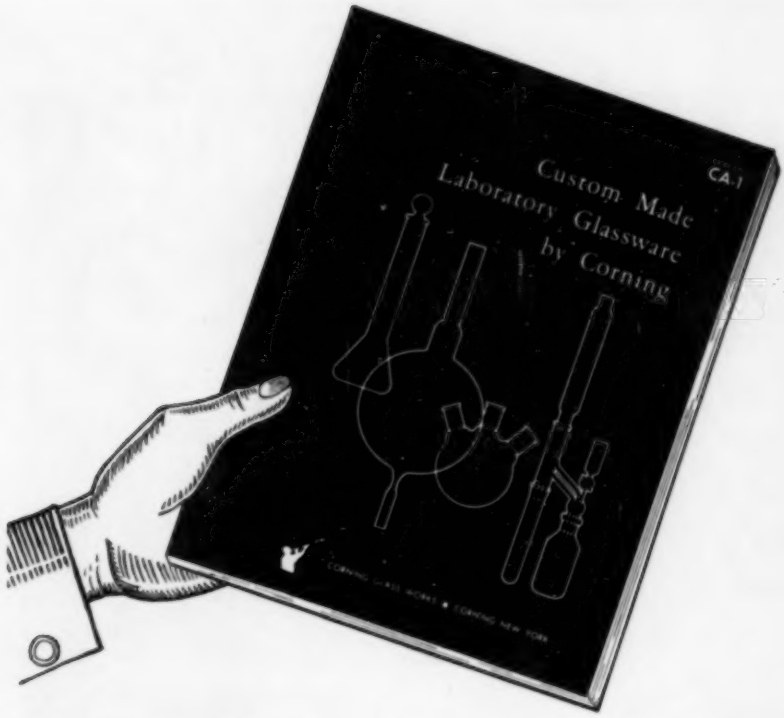

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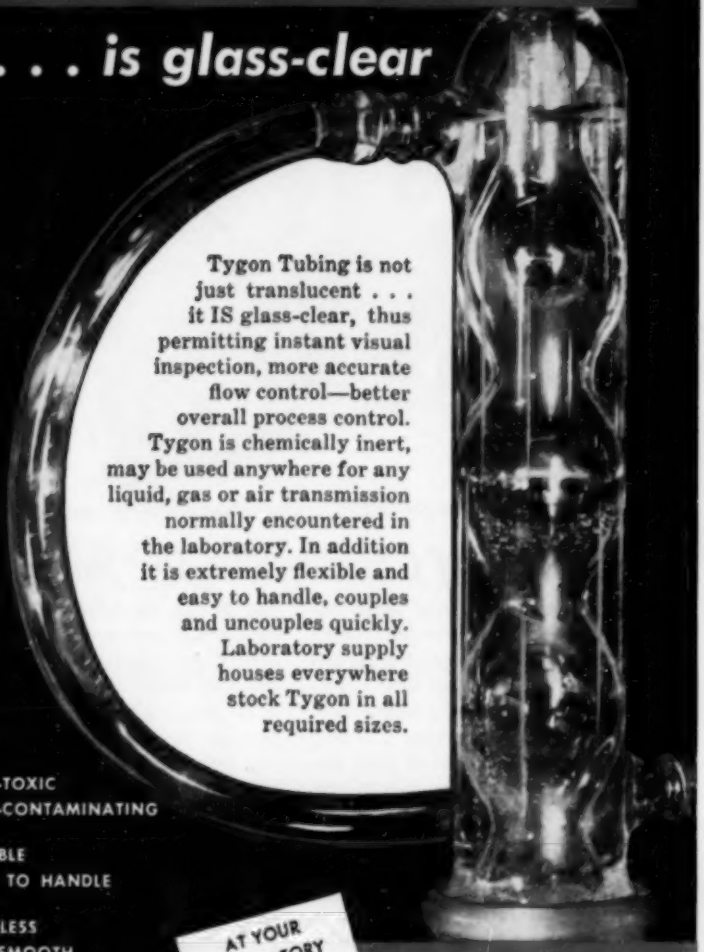

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